Digital breeding and assisted management in organic rabbit farming: the first results

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DIGITAL BREEDING AND ASSISTED MANAGEMENT IN ORGANIC RABBIT FARMING: THE FIRST RESULTS

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ABSTRACT

A smartphone application GAELA combining decision support (breeding management) and performance recording (single, direct and secure entry on a public server) for rabbit farming using individual monitoring of breeders was created. Performance of reproduction were compiled for 6 farms over 2 years of production (2018-2020). The livestock size averaged 30 does and varied largely among the farms. With 3.9 matings, 2.6 parturitions per female/year were obtained (66.8% fertility rate). Total number of kits born by parturition averaged 7.8 and total number of kits born alive averaged 7.1. The present study validated the utility of GAELA application and confirmed the modest performances in organic rabbit farming. The new version of GAELA application is available since the end of 2020. It provides new functions facilitating daily management and is improved to avoid entering incorrect information. New functions such as “Pregnancy Palpation”, “Adoption” and “Fattening Management” are also available in this version. The future version of GAELA will further provide the calculation and analysis of performances of breeders or of the flock, and it will build a national reference system for "non-conventional" rabbit farming.

Key words: Smartphone application, Performance referencing, Organic rabbit farming.

INTRODUCTION

The development of organic production is growing significantly since 2009. However, organic rabbit farming (ORF) remains a niche market in France (about 50 farms), and the consumer demand exceeds the supply (Roinsard *et al.*, 2016). ORF French specifications contain several rules and recommendations, such as whole year grazing, natural breeding, and slaughter after 100 days of age, housing in movable cages (**Figure 1**) or in paddocks, and use of breeds adapted to grazing and adapted to outdoor management. In indoor conventional rabbit farming, the breeding performance is referenced in a national database for more than 30 years. This allows identifying the technical progress or difficulties of rabbit farms, and to guide development and research efforts. In independent or organic rabbit farming there is no performance benchmarking. This lack of technical references is an obstacle to the development of the "alternative" rabbit sector, since such information allows farmers and supervisors to establish, organise and size an installation project.

Figure 1: Movable cages on pasture for organic rabbit farming (© INRAE, T. Gidenne)

The first effort was made to develop a computer tool to create a referencing system for ORF (Gidenne *et al.*, 2020). A referencing system to collect and analyse performance of French organic rabbit farms was created using an Excel application

(RTS2CuniBio). Nonetheless, the RTS2CuniBio tool is suitable for processing a limited number of farms (<5000 lines), and still needs a transfer of entry from traditional livestock paper notebook. We therefore aimed to expand this database to a larger number of farms, thanks to a new database management tool, associated with a smartphone application "GAELA". GAELA can also assist the farmer for the daily management of the rabbit.

MATERIALS AND METHODS

Animals and experimental design

The first version of GAELA was achieved in 2018 (**Figure 2**). It allows the direct entry of information concerning the reproducers (male or female), mating, parturition and weaning. It includes a calendar of actions and alerts (**Figure 3**), as well as a data synchronization with a secure database. With a fast, direct and unique entry of livestock data "at field". The internet connection is not necessary for entry of data. The synchronization by using internet allows transmission of data into a server, which

Figure 2: Homepage.

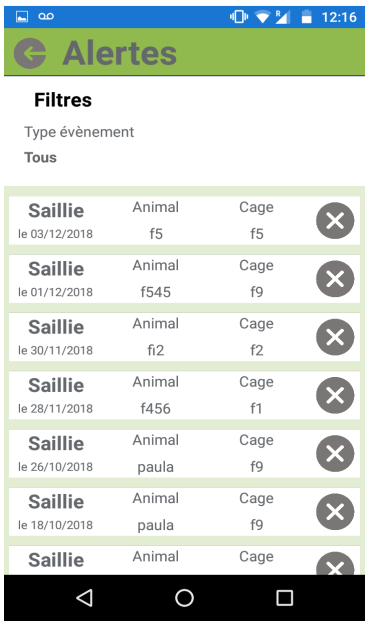

Figure 3: Reminders to enter the upcoming event.

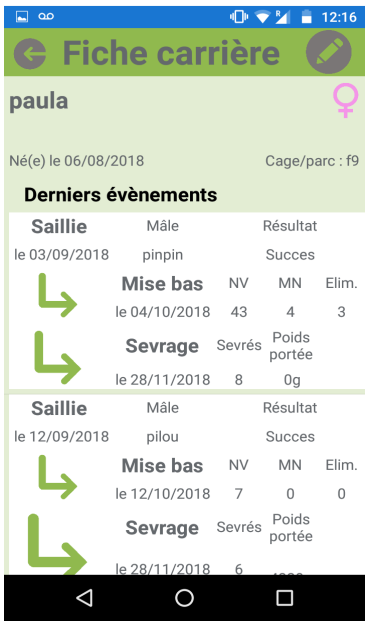

Figure 4: Performances of a doe.

constitutes the whole data set. The user can show in a page the reproduction performances of each female or male previously recorded (**Figure 4**). There were more than 10 farmers participated in the tests since 2018. We selected 6 farms that recorded regularly their data (from 2018 to 2020) for a preliminary analysis (Table 1). The analysis was restricted to reproductive performances.

RESULTS AND DISCUSSION

Descriptive analysis of the farms selected

The female livestock size among the farms was quite variable (**Table 1**), ranging from 9 to more than 70. It is noteworthy that many weaning results were lacking, especially in Farm D, only 31.5% of parturitions has records of weaning results. There was also a high variability in the management of the reproductive females, with a female to male ratio averaging 6.2 but ranging from 2.6 to 7.0. The reproductive rhythm (natural mating) was extensive, with 3.9 mating per female per year, leading to an average of 2.6 parturitions (or kindlings). The parturition interval averaged 3.3 months. This

information should be taken with caution because the entry of data may not be complete in some, especially in farm D and E there is a lot of lacking data of parturition.

Table 1 : Descriptive data of the livestock

Farm	**A**	**B**	**C**	**D**	**E**	**F**	**Average**
Reproductive females (mean number/year/farm)	29.1	70.8	32.0	21.0	9.1	15.5	29.6
Reproductive males (mean number/year/farm)	4.9	10.4	3.8	3.0	1.4	6.1	4.9
Female to male ratio	5.9	6.8	8.5	7.0	6.4	2.6	6.2
Matings/year	108	405	87	81	35	47	127
Parturitions/year	68	241	69	53	20	38	81
Weanings/year	64	204	45	17	16	26	62

Performances of the reproductive livestock (Table 2)

The fertility rate (averaged 66.8%) was higher than that previous study (60.3%, Gidenne et al., 2020), but varied according to the farm. The litter size (7.1 born alive) varied widely between farms (ranging from 3.9 to 9.0), it was lower than that previous study (8.0 born alive, Gidenne et al., 2020) based on results of 6 farms during 3 years (2015-2017), and was much lower than conventional rabbit farming (≈10, Coutelet, 2015).

Table 2 : Reproduction performances

Farm	A	B	C	D	E	F	Average
Matings/female/year	3.7	5.7	3.4	3.9	3.9	3.0	3.9
Matings/male/year	21.8	38.9	23.0	27.1	24.9	7.8	23.9
Fertility rate, %	63.0	59.6	79.4	65.5	56.0	77.2	66.8
Parturitions/female/year	2.3	3.4	2.7	2.5	2.2	2.4	2.6
Parturition interval, days	89.2	88.9	53.2	98.4	112.9	146.8	98.2
Total born/parturition	7.7	9.5	7.9	8.5	7.8	5.3	7.8
Born alive/parturition	7.3	9.0	6.6	8.3	7.3	3.9	7.1

Weaning performances (Table 3)

The age at weaning averaged 57.2 days (ranged from 42.5 to 74.2 days among the 6 farms). The survival rate of suckling kits at weaning averaged 69.3%, but with a large range between farms (46.2-89.0%). Except the results of farm E and F, the data were comparable to those observed by previous studies (Lebas *et al.,* 2002; Gidenne *et al.,* 2020). Accordingly, the number of weaned rabbits per parturition averaged 5.1. It should be noted that the Farm F (1.8 weaned rabbits per parturition) recorded abnormally a lot parturitions (n = 25) resulted in 0 kit weaned, which deserves to check if there were any health problems or typing errors.

The result confirmed the existence of a large progress margin in the management of the maternity unit (Gidenne *et al.,* 2020), by improving the survival rate before weaning (housing management, prophylaxy, etc.), while reducing the parturition interval, and without impairing the survival rate after weaning.

Table 3 : Weaning performances

Farm	A	B	C	D	E	F	Average
Age at weaning, days	42.5	65.0	45.1	74.2	61.1	55.3	57.2
Weaned number/parturition	6.1	6.4	5.9	6.0	4.0	1.8	5.1
Weaned number/female/year	14.4	21.8	9.6	15.2	9.0	4.3	16.8
Survival rate at weaning %	81.9	70.2	89.0	72.6	56.7	46.2	69.3

Improvement of GAELA application

The preliminary analysis permitted identification of technical progress potential. The second version of GAELA application (available since the end of 2020) added new alerts to avoid entering incorrect information, for example entering a parturition when the mating took place less than 29 days ago or more than 33 days (5% of the cases in present study). Other new functions are available, such as “Pregnancy Palpation” (notification alerts in the diary, between 10 and 15 days after mating), “Adoption” (allows also to record adoptions or withdrawals of kits at birth) and “Fattening Management” (possibility to withdraw one or more weaned rabbits, with recording of a cause of exit: sale, death or renewal).

The future version of GAELA will further provide the calculation and analysis automatic of performances of breeders or of the flock, and it will build a national reference system for "non-conventional" rabbit farming (such organic one). GAELA is not restricted to organic rabbit farmers, but to any rabbit farm wishing to monitor the individual career of each reproducer of its flock. GAELA can also be easily adapted for other farming systems (pigs, etc.).

CONCLUSION

GAELA application is simple and ergonomic, and is available on request to INRAE. It is intended to replace the traditional livestock notebook, and will allow analysis of individual farm performance. The present study validated the utility of GAELA application and confirmed the modest performances in ORF. The new version of GAELA application is available since the end of 2020, it has new functions facilitating daily management and is improved to avoid entering incorrect information.

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